



South Carolina Department of Health  
and Environmental Control

## **TIER I ASSESSMENT**

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## **TIER I ASSESSMENT**

- I. **Purpose** - This guidance document outlines the scope of work for a Tier I Assessment. The Tier I Assessment shall be conducted at sites where a release of petroleum from a regulated underground storage tank (UST) has been confirmed and additional information is necessary to further categorize the release. The objective of this standardized scope of work is the completion of a Tier 1 Risk-Based Corrective Action (RBCA) evaluation and site classification. All site rehabilitation activities must be conducted by a SCDHEC certified site rehabilitation contractor as required by the State Underground Petroleum Environmental Response Bank (SUPERB) Site Rehabilitation and Fund Access Regulations R.61-98. All site rehabilitation activities related to a release from an UST require technical approval by the Department in accordance with state and federal directives. In addition to technical approval, preapproval of all costs is required for payment from the SUPERB Account. Once any SUPERB deductible is met, the Department can directly procure the services of a site rehabilitation contractor for the UST owner or operator upon their request.
- II. **Standard** - The Tier I Assessment is a standardized scope of work; therefore, a work plan shall not be submitted to the Department. Upon receiving approval for implementation of the Tier I Assessment from the Department, the following scope of work should be completed at the designated site within 60 days from the date of approval or at a time designated by the Department:
- III. **Receptor - Utilities Survey / Site Survey**
- A. To successfully complete the receptor and utility surveys the contractor shall:
1. Locate all private and public water wells (drinking and other) and other potential receptors (as defined in the RBCA Guidance Document, i.e., utilities, surface waters, wetlands, basements) within a 1,000 foot radius of the site. Document the locations in the attached Tier I Assessment Report of Findings and depict the locations on the relevant portion of the appropriate United States Geological Survey 7.5 minute topographic map (Figure 1 of the Tier I Report of Findings).
  2. Note and record the current use of the site and adjacent land (residential, commercial, agricultural, industrial). The report shall include a summary of all zoning regulations concerning the installation of drinking and/or irrigation wells or land use. If no zoning regulations exist, the nearest property boundaries to the site shall be identified. In addition, the names and phone numbers of any persons that have provided information pertaining to land use or zoning ordinances, statutes, and/or regulations shall be provided. This information should be provided as Appendix F to the Tier 1 Report of Findings.
  3. The contractor must obtain a copy of the applicable portion of a tax map. This map shall depict the location of the facility, all impacted and properties, and all properties located adjacent to the impacted areas. The tax map and the names and addresses of the owners of each of the properties shall be provided as Appendix G of the Tier I Report of Findings.
  4. Locate and report all underground utilities (electrical, natural gas, telephone, water, cable TV, storm drain, and sewer lines) within a 250 foot radius of the site to the nearest one foot horizontally and obtain the depth to the nearest two feet vertically. Depict all identified underground utilities, both on and adjacent to the property, on a scaled site map (Figure 2 of the Tier I Report of Findings).
- B. If receptors are identified that may be impacted, immediately screen for hydrocarbons using a properly calibrated organic vapor analyzer, or other similar screening device. Water samples shall be obtained for all water supply wells within a 500 foot radius

of the site. If field screening indicates the presence of hydrocarbons, immediately notify the Department Project Manager within 48 hours of detection at (803) 898-4350 and provide the name, address, and a contact telephone number for all associated property owners. All field screening and laboratory data for these receptors shall be included in the report of findings.

- C. After completion of all field work (soil boring and monitoring well installation), a survey of the site shall be performed by a South Carolina Registered Surveyor. The survey shall include, at a minimum, all of the following:
1. the location of all manmade structures;
  2. all above ground and underground utilities;
  3. all potential receptors on site;
  4. all existing and/or former USTs and associated piping and dispensers; and
  5. all monitoring wells associated with the release.

#### IV. Soil Boring Installation, Sampling, and Analysis

- A. Install eight soil borings and collect from each boring enough soil for three laboratory samples from the interval with the highest screening value as follows:
1. UST Area: Install two soil borings to a depth of 25 feet or to the ground water table, whichever is shallower, in the area formerly occupied by the USTs or adjacent to the currently operating USTs.

Soil samples shall be collected at five foot intervals to the boring terminus. **DO NOT COLLECT SOIL SAMPLES BELOW THE WATER TABLE.**

2. Piping and Dispenser Area: Install five borings to a depth of ten feet or to the ground water table, whichever is shallower, in the area formerly occupied by the lines and product dispensers or adjacent to the currently operating product lines and dispensers. Soil samples shall be collected at two foot intervals to the boring terminus. **DO NOT COLLECT SOIL SAMPLES BELOW THE WATER TABLE.**
3. Background Soil Boring: Install one soil boring to a depth of 10 feet or to the ground water table, whichever is shallower, at least thirty feet away from any USTs, product lines, dispensers, and other potential sources of chemicals of concern (CoC). If the site is too small to allow a separation of thirty feet, install this soil boring as far away from all USTs, product lines, dispensers, and other potential sources of CoC as possible. Collect a soil sample from below the "A" horizon unless precluded by a shallow water table. **DO NOT COLLECT SOIL SAMPLE BELOW THE WATER TABLE.**

- B. Soil Sample Descriptions:

1. Describe the lithology for each soil sample collected during boring installation and screen for organic vapors utilizing properly calibrated instruments (for other less volatile chemicals, such as diesel or kerosene, alternative screening methods such as Field Gas Chromatograph, or immunoassay shall be used). The method of field screening to be utilized shall be included in the Standard Operating Procedures section of the report.
2. On separate logs for each boring, record the soil type, color of soil using

standard methods, rocks or minerals present, split-spoon sample intervals, and any organic vapor and field screening measurements. Additionally, a qualitative indication of soil conditions (dry, moist, wet, saturated) shall be noted on the logs. The boring logs shall note the depth of each sample submitted for analysis. Enclose the boring logs as Appendix A to the report.

- C. A soil sample from each boring around the USTs, piping and dispensers shall be submitted to a Department certified laboratory for analysis as follows:
1. The soil sample from each boring with the highest organic vapor measurement shall be submitted to a laboratory certified in South Carolina for the appropriate analysis. If the concentrations for all samples in a boring are within ten percent of each other, the sample from the greatest depth in the vadose zone shall be submitted for analysis. At each sampling location or interval, a high-level ( $>200 \text{ ug/kg}$ ) or low-level ( $\leq 200 \text{ ug/kg}$ ) sample based on soil screening results, shall be collected in accordance with EPA Method 5030B and 5035 protocol, respectively. The number and type of sampling containers, weighing of samples in the field, use of preservatives, and holding times must be in accordance with SW846, Test Methods for Evaluating Solid Wastes. All industry standard quality assurance and quality control methods shall be followed for shipping (sample label, sealed sample containers, chain of custody prepared, stored on ice). The sampling logs should note the location and type of each sample submitted for analysis.
  2. The seven soil samples (one from each soil boring) shall be analyzed for the appropriate analyses as listed in Table 1. Field sampling logs, chain of custody forms, certificates of analysis, and the lab certification number will be added to the report as Appendix C. The sampling methodology and analytical protocol used by the contractor should comply with industry accepted QA/QC standards for site assessment activities.

TABLE 1	Soil Samples	Water Samples
PRODUCT	Analyte....Method*.....RL**	Analyte.....Method*.....RL**
Gasoline, Diesel, Fuel Oil, Kerosene	BTEX.....5035/8260B.....5Fg/kg Naphthalene.....5035/8260B.....5Fg/kg PAH.....3550B/8270C.....660Fg/kg TPH(DRO).....3550B/8015B.....10mg/kg Total Organic Carbon.....9060.....10 mg/kg	BTEX.....5030B/8260B.....5Fg/l Naphthalene.....5030B/8260B.....5Fg/l MTBE.....5030B/8260B.....40Fg/l EDB.....5030B/8260B.....5Fg/l PAH.....3510C/8270C.....10Fg/l Dissolved Oxygen & Carbon Dioxide.....SM4500-O G.....1.0mg/l Ferrous Iron.....SM3500-Fe D.....30Fg/l Total Lead(unfiltered).....7421.....5Fg/l Methane.....Kerr Method.....1mg/l Nitrates.....9056 or 9210.....100Fg/l Sulfates.....9056 or 9038.....0.1mg/l

Table 1 continued on next page.

<b>TABLE 1 (cont)</b>	Soil Samples	Water Samples
PRODUCT	Analyte.....Method*.....RL**	Analyte.....Method*.....RL**
Waste Oil	BTEX.....5035/8260B.....5Fg/kg Naphthalene.....5035/8260B.....5Fg/kg PAH.....3550B/8270C.....660Fg/kg TPH (DRO).....3550B/8015B.....10mg/kg Total Organic Carbon.....9060...0.10mg/kg Metals Lead.....7421.....250Fg/kg Mercury.....7471A.....10Fg/kg Arsenic.....7060A.....250Fg/kg Barium.....6010B.....2,500Fg/kg Cadmium.....7131A.....500Fg/kg Chromium.....7191.....250Fg/kg Selenium.....7740.....250Fg/kg Silver.....7761.....250Fg/kg	BTEX.....5030/8260B.....5Fg/l Naphthalene.....5030/8260B.....5Fg/l TPH.....9071.....40mg/l PAH.....3510C/8270C.....10Fg/l Dissolved Oxygen & Carbon Dioxide...SM4500- O G.....1.0mg/l Ferrous Iron.....SM3500-Fe D.....30Fg/l Nitrates.....9056 or 9210.....100Fg/l Sulfates.....9056 or 9038.....1mg/l Methane.....Kerr Method.....1mg/l Metals Lead.....7421.....5Fg/l Mercury.....7470A.....0.2Fg/l Arsenic.....7060A.....5Fg/l Barium.....6010B.....50Fg/l Cadmium.....7131A.....0.1Fg/l Chromium.....7191.....5Fg/l Selenium.....7740.....5Fg/l Silver.....7761.....5Fg/l

BTEX - Benzene, Toluene, Ethyl-benzene, Xylenes  
 Naphthalene - **TOTAL** Naphthalenes  
 MTBE - Methyl Tertiary Butyl Ether  
 PAH - Polynuclear Aromatic Hydrocarbons (Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Dibenz(a,h)anthracene)  
 EDB - Ethylene dibromide  
 \* - **OR** equivalent method that can achieve the same reporting limits; for Dissolved Oxygen, Carbon Dioxide, and Ferrous Iron, include field methods  
 \*\* - RL = Reporting Limit

3. The other two soil samples from the soil boring with the sample exhibiting the highest organic vapor will be submitted to a laboratory as follows :
  - a. One soil sample shall be submitted for a grain size/hydrometer analysis to determine the sand, silt and clay fractions at 0.074 millimeters (#200 screen) and 0.004 millimeters respectively. The sampling logs shall note the location and type of each sample submitted for analysis. The laboratory results should be included with other analytical results in the report.
  - b. The final sample shall be analyzed for Total Petroleum Hydrocarbons using Environmental Protection Agency (EPA) method 3550. All laboratory analysis must be performed by a laboratory that is currently certified by DHEC for the relevant methods. The sampling logs shall note the location and type of each sample submitted for analysis. The chain of custody forms, certificates of analysis, and the laboratory certification number should be included with other analytical results.
4. The soil sample collected from the background soil boring shall be analyzed for total organic carbon utilizing EPA method 415.1 or EPA equivalent. Record the location on the sampling logs and properly prepare the sample for shipping to an approved laboratory. The chain of custody and laboratory forms shall be included with other analytical results in Appendix C. The total organic carbon value should be recorded in the Tier I Report of Findings. The details of the boring will be included in Appendix A with the other soil borings.

## V. Soil Boring Abandonment

The soil boring with the soil sample exhibiting the highest organic vapor concentration and the background sample shall each be converted to a permanent monitoring well as described in Section VI. All other soil borings must be properly abandoned under the

supervision of a South Carolina Certified Well Driller in accordance with the South Carolina Well Standards and Regulations R.61-71.

## **VI. Permanent Monitoring Well Installation, Sampling, and Analysis**

- A. A total of three two-inch PVC casing wells, with ten-foot screens bracketing the water table shall be installed. The wells will require proper filter pack, grout, locking well cap, data plate, and well vault with a cover held in place with bolts or screws. The wells must be installed by a South Carolina Certified Well Driller and constructed in compliance with the South Carolina Well Standards and Regulations. Monitoring well construction logs shall be prepared to include all information as outlined in the S.C. Well Standards and Regulations R.61-71.IIE(2) and be attached to the report as Appendix B. The locations of the wells are as follows:
1. Convert the soil boring with the sample exhibiting the highest organic vapor concentration to a monitoring well. If the soil boring with the highest organic vapor concentration is within 25 feet of an existing viable ground-water monitoring well, place the well in another optimum location. Please contact the SCDHEC project manager if assistance in placing wells is needed.
  2. Convert the background soil boring to a monitoring well.
  3. Construct one additional monitoring well in a position on the site so that the direction of ground-water flow and concentrations of the CoC in the source area can be determined. This well may not be constructed in a previous boring.
  4. Soil samples shall be collected at five-foot intervals for organic vapor analysis during the drilling of the borehole for each intended well. The sampling logs should note the location and type of each sample submitted for analysis. Record the soil boring data in Appendix A with the other soil boring data. The monitor well construction logs will be included in Appendix B. The soil sample exhibiting the highest concentration of CoC from each borehole shall be submitted for laboratory analysis as listed in Table 1. If screening levels for all samples are within ten percent, then the deepest sample (ABOVE THE VADOSE ZONE) shall be submitted for analysis. The chain of custody and laboratory forms should be included with other analytical results in Appendix C.
- B. Document the well as follows :
1. Describe the lithology for each soil sample collected during drilling for well installation and screen each sample for organic vapors utilizing properly calibrated instruments.
  2. On separate drilling logs for each well, record the soil type, color of soil using standard methods, rocks or minerals present, split-spoon sample intervals, any organic vapor and field screening measurements. Additionally, a qualitative indication of soil conditions (dry, moist, wet, saturated, and odor if present) shall be noted on the logs. The logs shall note the depth of each sample submitted for analysis. Additionally, DHEC Form 1903, "Water Well Record" shall be completed for each well and included in Appendix B.

C. After well installation :

1. All three wells must be properly developed. The development method, chosen by the contractor, shall be capable of removing enough solids, drilling muds, and water to provide relatively sediment-free water samples. The purge waters shall be measured for pH, specific conductance, and temperature. All development waters must be containerized and disposed of in an appropriate manner.
2. Survey the elevation of the Top of Well Casing (TOC) for each well relative to an established datum on site. The location of the datum point shall be marked on the site map.
3. The static water level in each well shall be measured after each well is developed. If free product is present, the thickness of the free product shall be measured. The distance to the nearest 0.01 foot from the Top of Well Casing (TOC) to the ground-water table and/or free product shall be measured to the nearest 0.01 foot and recorded.

D. After development of the wells :

1. Purge wells. Purging is considered complete once the ground-water temperature and pH measurements have equilibrated. Please include field data that documents temperature and pH measurements during purging for each well in tabular form. All measurements shall be submitted to the Department following sampling. Purging shall not be performed in a well if the thickness of free product exceeds 0.01 foot. After purging is complete, the dissolved oxygen content for each well shall be measured and reported. All purge waters must be containerized and disposed of in an appropriate manner.
2. The thickness of free product shall be measured. If the free phase product thickness exceeds 0.01 foot, a ground-water quality sample and dissolved oxygen measurement should not be collected. Otherwise, a ground-water sample for each well shall be collected and submitted to a SC certified laboratory for appropriate analysis as listed in Table 1. Prior to collecting a groundwater sample from each well, the dissolved oxygen content for each well shall be measured and reported. Sampling logs shall note the depth of each sample submitted for analysis. All industry standard quality assurance and quality control methods shall be followed for collection and shipping of samples (no air in the sample, sample labeled, sample containers sealed, chain of custody forms prepared, stored on ice). Metal samples should not be filtered. Laboratory data for each sample (field sampling logs, chain of custody forms, certificates of analysis, and the lab certification number) shall be added to the report as Appendix C.
3. Store all soil and ground water generated during boring construction and monitoring well development/purging in 55 gallon drums or equivalent containers. Upon receipt of laboratory analysis results, properly dispose of the wastewater and soil as appropriate. Copies of certificates of disposal will be included in



## Appendix E.

- E. If any other monitoring wells exist on site (e.g., Initial Ground-Water Monitoring well), purge and sample as appropriate.

### VII. Aquifer Evaluation

Two separate aquifer slug tests shall be completed from different monitoring wells located **outside the UST area** to determine aquifer characteristics. Record the change in the groundwater table vs time for each well. The slug tests shall be evaluated in accordance with commonly accepted methods (e.g., Bower and Rice, Hvorslev). Enter data on form in Appendix D.

### VIII. Tier I Evaluation

Based on the data gathered from the field work, a Tier I evaluation shall be completed. The Tier I assessment shall evaluate the actual and/or potential impact to receptors following the steps outlined below.

- A. Comparison With Risk Based Screening Levels (RBSL) - For a Tier 1 Risk Evaluation, it is assumed that all exposure points are located in the source area. CoC concentrations shall be compared with the values provided in the RBSL Look-Up Tables of the Risk-Based Corrective Action for Petroleum Releases Guidance Document, as appropriate.

The following measurements of representative concentrations of CoC are to be utilized in this comparison:

1. **Air:** The maximum CoC vapor concentration obtained during the last sampling event shall be used. Historical sampling events can be used to establish trends.
2. **Ground Water:** The maximum CoC concentration obtained during the last sampling event shall be used. Historical sampling events can be used to establish trends.
3. **Soil:** The maximum CoC concentration obtained during the last sampling event shall be used for the ingestion and dermal contact pathways. For the soil leaching to ground water pathway, the average of the two soil sample results with the highest non-zero concentrations from each source area shall be used.

- B. Site Conceptual Exposure Model - The site conceptual model shall identify all complete exposure pathways. Information required to develop this model includes:
  1. Release information - Pertinent release information may include, but is not limited to, the historical use of the property where the release occurred, the approximate age of the release, and the properties of the CoC (e.g., solubility, volatility) that were released.

2. Characteristics of the site - Pertinent site characteristics may include, but are not limited to, the soil type, depth to ground water, hydraulic gradient, ground-water flow direction, seepage velocity, and the physical distribution of CoC around the source.
3. Proximity of potential receptors and their construction - The construction specifications (e.g., depth, diameter, and material of construction of a storm sewer) of all potential receptors shall be identified.
4. Current land use of all affected properties - For each property that is impacted, may potentially become impacted, or is adjacent to a potentially impacted property, the current land use shall be identified (e.g., vacant lot, restaurant, school, residence, factory).
5. Applicable zoning or land use ordinances - The local city or county administrative authorities shall be contacted for information pertaining to any applicable zoning **and** land use ordinances. Zoning ordinances set broad-scale restrictions on property development such as residential, commercial, or industrial. Land use ordinances may establish smaller scale restrictions such as disallowing the installation of drinking water or irrigation wells. A photocopy of the applicable sections or summary of the ordinances shall be provided. If a copy cannot be obtained, name, phone number, and business address of the appropriate authorities shall be provided with the relevant information.

Based on the estimated age of the release, known distribution of the CoC, and the potential for migration, all complete and potential exposure pathways shall be identified and summarized for land use (current and future conditions). The following potential exposure pathways shall be considered for evaluation:

- |                    |  |
|--------------------|--|
| 1) Air             | <ul style="list-style-type: none"> <li>- inhalation of ambient vapors (particulate or volatile)</li> <li>- explosive hazard</li> </ul>   |
| 2) Surface Water   | <ul style="list-style-type: none"> <li>- ingestion</li> <li>- dermal contact</li> <li>- volatile inhalation (enclosed space and outdoor)</li> </ul>  |
| 3) Ground Water    | <ul style="list-style-type: none"> <li>- ingestion</li> <li>- dermal contact</li> <li>- volatile inhalation (enclosed space and outdoor)</li> </ul>  |
| 4) Surficial Soil  | <ul style="list-style-type: none"> <li>- ingestion</li> <li>- dermal contact</li> <li>- volatile inhalation (particulate or volatile)</li> </ul>   |
| 5) Subsurface Soil | <ul style="list-style-type: none"> <li>- ingestion (during excavation)</li> <li>- dermal contact (during excavation)</li> <li>- volatile inhalation (particulate or volatile)</li> <li>- leaching to ground water</li> </ul> |

- C. Identify Data Requirements - Identify the data necessary to characterize the migration potential, and to quantify the potential impact, for each complete, or potentially complete, exposure pathway identified in the site conceptual model above. Enter all identified data requirements in the table in the Tier 1 Report of Findings.
- D. Recommendations for Further Action - Utilizing the information above, a decision as to the next appropriate action shall be made. Three recommendations are possible :
  - 1. No Further Action - If the concentrations of the CoC are below the RBSL, further assessment and/or cleanup is not necessary. For the RBSL comparisons to be valid, it must be reasonably demonstrated that the sample locations are representative of the source area.
  - 2. Abatement - If concentrations of CoC are above the respective RBSLs and pose an immediate or imminent hazard, partial source removal or other actions shall be necessary to reduce the risk. Active Corrective Action shall be required to remove free-product pursuant to R.61-92, Section 280.
  - 3. Tier 2 Investigation - If concentrations of CoC are above the RBSL, Tier 2 investigation would be warranted under the following conditions:
    - a. If the SSTL developed under Tier 2 investigation is predicted to be significantly different than the Tier 1 RBSL (i.e. the use of site-specific data would allow different site-specific cleanup goals to be determined).
    - b. If, by developing site-specific cleanup goals, the cost for additional assessment and remedial action will be less than cleanup to RBSLs.
    - c. If the approach or the assumptions used to derive the Tier 1 goals were not appropriate for conditions at the site.
    - d. If data suggest that intrinsic remediation actions are appropriate.

## **IX. Report of Findings**

All sections of the TIER I ASSESSMENT REPORT OF FINDINGS shall be completed. The report shall be reviewed and signed by a qualified professional engineer or professional geologist registered in the state of South Carolina from a DHEC certified UST company or firm.

## **X. Map Preparations**

- A. Prepare a copy of the relevant portion of the appropriate United States Geological Survey 7.5 minute topographic map. Indicate the location of the site and the location of any receptors (e.g., marsh, groundwater well, city water well, etc.). The figure will be captioned with the facility name and address, facility number, date, and bar scale. The map should include a north arrow. Label the map as Figure 1 and attach to the Tier I Report of Findings.
- B. Prepare a base map to scale and plot all the utilities. All items should be plotted to an accuracy of 1 foot ( $\pm$  2 feet). The site survey should include:

- (1). Location of property lines
- (2). Streets and highways (indicating names)
- (3). Location of buildings
- (4). Paved areas on or adjacent to site
- (5). Location of all present and former above ground and underground storage tanks and associated lines, pumps, and dispensers
- (6). Underground utilities on or adjacent to site (sewer, water, gas, telephone, electric, etc.)
- (7). Location of any other potential receptors
- (8). Eight soil boring locations
- (9). Three monitoring well locations

The base map will be captioned with the facility name and address, UST Permit number, date, and bar scale. The map should include a north arrow. Make copies of this map for use as specified below. Label the map as Figure 3 and attach to the Tier I Report of Findings.

- C. Prepare a CoC site map from the copy of the base map made earlier. Add soil boring locations, and accompanying soil data. The soil analytical data should be plotted adjacent to each soil boring (SB) using the following format:

SB-Number  
Sample Depth (feet)  
Benzene (mg/kg)  
Toluene (mg/kg)  
Ethylbenzene (mg/kg)  
Xylenes (mg/kg)  
Naphthalene (mg/kg)  
PAHs (mg/kg)

Label the Soil CoC site map as Figure 4 and add to the Tier I Report of Findings.

- D. Prepare a CoC site map from the copy of the base map made earlier. Add all monitoring well locations, potentiometric surface (elevation) data, and accompanying groundwater data. The groundwater data should be plotted adjacent to the monitoring wells (MW) using the following format:

MW-Number  
Benzene (ug/l)  
Toluene (ug/l)  
Ethylbenzene (ug/l)  
Xylenes (ug/l)  
Naphthalene (ug/l)  
PAHs (ug/l)

Label the CoC site map as Figure 5 and add to the Tier I Report of Findings. Do not show total BTEX concentrations.

NOTE: These specifications detail the specific tasks required to successfully define the scope of work for the Tier 1 Assessment. These specifications do not include general implied tasks as required by Federal, State or local governments (OSHA 40 hour training, Health and Safety Plans, business licenses, etc.).

## **XI. Attachments**

The following shall be included in the Report of Findings, as appropriate:

Figure #1 - Topographic Map  
Figure #2 - Scaled Site Location Map  
Figure #3 - Surveyed Site Map  
Figure #4 - Soil CoC Site Map  
Figure #5 - Ground Water CoC Site Map  
Appendix A - Soil Boring Logs  
Appendix B - Monitor Well Construction Logs  
Appendix C - Chain of Custody and Laboratory Forms  
Appendix D - Slug Test Data Form  
Appendix E - Soil and Water Disposal Manifests  
Appendix F - Copy of local zoning regulations  
Appendix G - Copy of tax map and list of names and addresses of adjacent  
property owners

## TIER I ASSESSMENT REPORT OF FINDINGS

### I. INTRODUCTION

#### A. **Owner/Operator Information**

Facility name \_\_\_\_\_ UST Permit # \_\_\_\_\_  
Name \_\_\_\_\_  
Address \_\_\_\_\_  
Telephone Number (include area code) \_\_\_\_\_

#### B. **Property Owner Information**

Name (if different from above) \_\_\_\_\_  
Address \_\_\_\_\_  
Telephone Number (include area code) \_\_\_\_\_

#### C. **Contractor Information**

Name \_\_\_\_\_ SCDHEC Certification # \_\_\_\_\_  
Address \_\_\_\_\_  
Telephone Number (include area code) \_\_\_\_\_

#### D. **Facility Information**

Address \_\_\_\_\_  
Description of Adjacent Land Use (Commercial, residential, rural, etc.) Include documentation (e.g. zoning regulations) as appropriate. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Predicted Future Land Use (include site and adjacent area) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

#### E. **Facility History**

Date Release Reported to SCDHEC \_\_\_\_\_  
Estimated Quantity of Product Released \_\_\_\_\_  
Cause of Release \_\_\_\_\_

UST #	Product	Date Installed	Currently in use (Yes or No)	If not in use, Date Removed
1				
2				
3				
4				
5				
6				
7				

Other Releases at this site? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, Date Release Reported to SCDHEC \_\_\_\_\_

Status of Release \_\_\_\_\_

No Further Action Date \_\_\_\_\_

## II. SITE CHARACTERISTICS

### A. Site Geography

Describe the topography of the site and surrounding area (slope, vegetation, bodies of water, major land features, etc.)

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Mean Elevation of Site \_\_\_\_\_

Additional Comments \_\_\_\_\_

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### B. Exposure Analysis

Describe all potential receptors and preferential pathways within a 1000-foot radius of the site.

Description of Receptor	Distance/Direction from Site


Provide any additional comments necessary to complete the exposure analysis \_\_\_\_\_

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C. Utilities Survey

List the utilities on site, and adjacent to the site within a 250-foot radius, that could serve as exposure points or as preferential pathways.

Utility	On-site or Distance/Direction from site	Depth to Utility

Additional Comments \_\_\_\_\_

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D. Site Geology

Provide a brief description of the regional geology and hydrogeology \_\_\_\_\_

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Provide a brief description of the site specific geology and stratigraphy \_\_\_\_\_

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E. Soil Boring Data

Drilling Dates \_\_\_\_\_

Provide a brief justification for the location of the soil borings

SB-1 \_\_\_\_\_

SB-2 \_\_\_\_\_

SB-3 \_\_\_\_\_

SB-4 \_\_\_\_\_

SB-5 \_\_\_\_\_

SB-6 \_\_\_\_\_

SB-7 \_\_\_\_\_

SB-8 \_\_\_\_\_

Standard Operating Procedure for Field Screening:

Complete the table below for each soil boring.

**UST Area Borings -**

Borehole SB-	Sampling Date-	Sample Depth-	
Split Spoon Interval (ft.)	Field Screening Results (mg/kg)	Lithology (soil type, color, rocks/ minerals present)	Soil Conditions (dry, moist, etc; petroleum odor)

Borehole SB-	Sampling Date-	Sample Depth-	
Split Spoon Interval (ft.)	Field Screening Results (mg/kg)	Lithology (soil type, color, rocks/ minerals present)	Soil Conditions (dry, moist, etc; petroleum odor)

**Piping and Dispenser Area Borings -**

Borehole SB-	Sampling Date-	Sample Depth-	
Split Spoon Interval (ft.)	Field Screening Results (mg/kg)	Lithology (soil type, color, rocks/ minerals present)	Soil Conditions (dry, moist, etc; petroleum odor)

Borehole SB-	Sampling Date-	Sample Depth-	
Split Spoon Interval (ft.)	Field Screening Results (mg/kg)	Lithology (soil type, color, rocks/ minerals present)	Soil Conditions (dry, moist, etc; petroleum odor)


**Borehole SB-                      Sampling Date-                      Sample Depth-**

Split Spoon Interval (ft.)	Field Screening Results (mg/kg)	Lithology (soil type, color, rocks/ minerals present)	Soil Conditions (dry, moist, etc; petroleum odor)

**Borehole SB-                      Sampling Date-                      Sample Depth-**

Split Spoon Interval (ft.)	Field Screening Results (mg/kg)	Lithology (soil type, color, rocks/ minerals present)	Soil Conditions (dry, moist, etc; petroleum odor)

**Borehole SB-                      Sampling Date-                      Sample Depth-**

Split Spoon Interval (ft.)	Field Screening Results (mg/kg)	Lithology (soil type, color, rocks/ minerals present)	Soil Conditions (dry, moist, etc; petroleum odor)


Background Boring -

**Borehole SB-**

**Sampling Date-**

**Sample Depth-**

Split Spoon Interval (ft.)	Field Screening Results (mg/kg)	Lithology (soil type, color, rocks/ minerals present)	Soil Conditions (dry, moist, etc; petroleum odor)

Enter the soil analytical data for each soil boring for all COC in the table below and on the following page. Enter the appropriate RBSL for the soil type from Tables 4 through 8 in SCDHEC Risk-Based Corrective Action (RBCA) for Petroleum Releases Guidance Document.

CoC	RBSL	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6	SB-7	SB-8
Benzene									
Toluene									
Ethylbenzene									
Xylenes									
Total BTEX	N/A								
Naphthalene									
Benzo(a)anthracene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Chrysene									
Dibenz(a,h)anthracene									
TPH (EPA 3550)	N/A								
TOC (Background boring)	N/A								

Discuss the horizontal and vertical extent of COC in the soil \_\_\_\_\_

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Additional Comments \_\_\_\_\_

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F. Chemicals of Concern - Ground Water

Provide well installation information in the table below.

MW #	Installation Date	Development Date	Sampling Date


Enter the soil analytical data for each monitoring well for all CoC in the table below.

CoC	MW-	MW-	MW -	MW -
Depth of sample				
Benzene				
Toluene				
Ethylbenzene				
Xylenes				
Total BTEX				
Naphthalene				
Benzo(a)anthracene				
Benzo(b)fluoranthene				
Benzo(k)fluoranthene				
Chrysene				
Dibenz(a,h)anthracene				
Lead				
EDB				

Summarize the monitoring well and ground-water data in the table below.

MW #	TOC Elevation (ft)	Screened Interval (ft)	Depth to Water (ft)	Water Table Elevation (ft)

Enter field data measurements (temperature, pH, conductivity) taken during well purging on the form provided. Complete for each well.

Enter dissolved oxygen measurements for each well in the table below.

Monitoring Well #	MW-	MW-	MW-	MW-
Dissolved Oxygen (mg/l)				

Enter the ground water analytical data for each monitoring well for all CoC in the table below. If free product is present, indicate the measured thickness to the nearest 0.01 feet.

CoC	RBSL (ug/l)	MW-	MW-	MW -	MW -
Free Product Thickness	None				
Benzene	5				

Toluene	1,000				
Ethylbenzene	700				
Xylenes	10,000				
Total BTEX	N/A				
MTBE	40				
Naphthalene	25				
Benzo(a)anthracene	10				
Benzo(b)fluoranthene	10				
Benzo(k)fluoranthene	10				
Chrysene	10				
Dibenz(a,h)anthracene	10				
Ferrous Iron	N/A				
Lead	Site Specific				
Nitrates	N/A				
Sulfates	N/A				

Additional Comments \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

G. Aquifer Characteristics

Hydraulic Conductivity \_\_\_\_\_

Hydraulic Gradient \_\_\_\_\_

Porosity \_\_\_\_\_

Estimated Seepage Velocity \_\_\_\_\_

Complete the slug test form and include in Appendix D of the report. Include all data, graphs, and equations used to derive the aquifer characteristics and hydrologic parameters (hydraulic conductivity, seepage velocity, hydraulic gradient, etc.) in Appendix D.

### III. Tier I Evaluation

- A. CURRENT LAND USE - Identify any potential receptors or human exposure pathways (e.g. basements, contaminated soils from UST closures, etc.) within a 1000-foot radius for current land use. Complete the table below. Additional sheets may be attached if necessary.

Media (for exposure)	Exposure Route	Pathway Selected for Evaluation? (Yes or No)		Exposure point or Reason for Non-Selection	Data Requirements (IF pathway selected)
Air	Inhalation	Yes	No		
	Explosion Hazard	Yes	No		
Ground-Water	Ingestion	Yes	No		
	Dermal Contact	Yes	No		
	Inhalation	Yes	No		
Surface Water	Ingestion	Yes	No		
	Dermal contact	Yes	No		
	Inhalation	Yes	No		
Surficial Soil	Ingestion	Yes	No		
	Dermal contact	Yes	No		
	Inhalation	Yes	No		
	Leaching to Ground-Water	Yes	No		
Subsurface Soil	Ingestion	Yes	No		
	Dermal contact	Yes	No		
	Volatile Inhalation	Yes	No		
	Leaching to Ground-Water	Yes	No		

- B. FUTURE LAND USE - Identify any potential receptors or human exposure pathways (e.g. basements, contaminated soils from UST closures, etc.) within a 1000-foot radius for projected future land use. Complete the table below. Additional sheets may be attached if necessary

Media (for exposure)	Exposure Route	Pathway Selected for Evaluation? (Yes or No)		Exposure point or Reason for Non-Selection	Data Requirements (IF pathway selected)
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Air	Inhalation	Yes	No		
	Explosion Hazard	Yes	No		
Ground-Water	Ingestion	Yes	No		
	Dermal Contact	Yes	No		
	Inhalation	Yes	No		
Surface Water	Ingestion	Yes	No		
	Dermal contact	Yes	No		
	Inhalation	Yes	No		
Surficial Soil	Ingestion	Yes	No		
	Dermal contact	Yes	No		
	Inhalation	Yes	No		
	Leaching to Ground-Water	Yes	No		
Subsurface Soil	Ingestion	Yes	No		
	Dermal contact	Yes	No		
	Inhalation	Yes	No		
	Leaching to Ground-Water	Yes	No		

#### IV. Maps and Figures

Complete and attach all maps and appendices as outlined below.

##### A. Figures

All maps must include the following :

- the facility name,
- address,
- SCDHEC UST Permit number,
- date
- bar scale,
- north arrow.

##### 1. Figure 1 - Topographic Map

Prepare a copy of the relevant portion of the appropriate United States Geological Survey 7.5 minute topographic map. Indicate the location of the site and location of any receptors (e.g., marsh, ground-water well, city water well, etc.).

##### 2. Figure 2 - Scaled Site Location Map

Prepare a site location map identifying the site and any pertinent property boundaries (residential and commercial), streets, receptors, etc. within a 500 foot radius.

##### 3. Figure 3 - Surveyed Site Map

Prepare a site base map to scale and plot all the utilities. This map will include:

- a. Location of property lines.
- b. Streets and highways (indicate names).
- c. Location of buildings.
- d. Paved areas on or adjacent to site.
- e. Location of all present and former above ground and underground storage tanks and associated lines, pumps, and dispensers.
- f. Underground utilities on or adjacent to site (sewer, water, telephone, gas, electric, etc.).
- g. Location of any other potential receptors.
- h. Eight soil boring locations.
- i. Three monitoring well locations.
- j. Survey datum location.

##### 4. Figure 4 - Soil COC Site Map

Prepare a COC site map from a copy of Figure 3. Add all accompanying soil data. The soil analytical data will be plotted adjacent to each soil boring (SB) using the following format:

SB #	
Sample Depth (ft)	
Benzene (mg/kg)	
Toluene (mg/kg)	
Ethylbenzene (mg/kg)	
Xylenes (mg/kg)	
PAHs (mg/kg)	

##### 5. Figure 5 - Ground Water COC Site Map

Prepare a COC site map from a copy of Figure 3. Add potentiometric surface (elevation) data, an arrow indicating ground water flow direction, and accompanying ground-water data. The ground-water data should be plotted adjacent to the monitoring wells (MW) using the following format:

MW #	
Ground water elevation	
Benzene (ug/l)	
Toluene (ug/l)	
Ethylbenzene (ug/l)	

Xylenes (ug/l)	
PAHs (ug/l)	

## B. Appendices

### 1. **Appendix A** - Soil Boring Logs

The soil boring logs should indicate lithology, water level (if encountered), split-spoon sample intervals and field screening results. Also, the presence of hydrocarbon odors and qualitative indication of soil conditions (dry, moist, wet, saturated, etc) should be noted on the logs.

### 2. **Appendix B** - Monitoring Well Construction Logs

The monitoring well constructions logs must include all information as outlined in the S.C. Well Standards and Regulations R.61-71.11E(2). Additionally, a copy of DHEC Form 1903 (Water Well Record) should be included for each monitoring well installed.

### 3. **Appendix C** - Chain of Custody and Laboratory Forms

A copy of the completed chain of custody, certificates of analysis and field sampling logs should be attached. The sampling logs should note the location and type of each sample submitted for analysis. The laboratory certificates of analysis should include the analytical results, the reporting limit, the analytical method utilized, and the laboratory certification number.

### 4. **Appendix D** - Slug Test Data Form

The slug test summary forms, and all data, graphs, and equations that were used to derive the aquifer characteristics and hydrologic parameters should be included.

### 5. **Appendix E** - Soil and Water Disposal Manifests

### 6. **Appendix F** - Copy of Zoning Regulations

### 7. **Appendix G** - Copy of Tax Map

The tax map should be accompanied by the list of names and addresses of adjacent property owners.